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TWO COMMERCIAL THINNINGS IN CENTURY-OLD DOUGLAS-FIR

By

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As young-growth forests replace old-growth forests as the primary source of Douglas-fir raw material, the technique of managing young stands becomes increasingly important. Managers of young-growth timber need to know whether it is economical and silviculturally feasible to make thinnings in stands that are close to rotation age. Final harvest of some stands of this age might be delayed for perhaps two decades if in the meantime some income could be obtained from them in the form of thinnings.

This paper describes a thinning operation in such a stand, in which trees that would have died before the time of harvest were removed and utilized. The thinning also resulted in the salvage of many trees killed by bark beetles. Two light thinnings, 13 years apart, proved feasible in hundred-year-old Douglas-fir, and a third thinning may be practical.

The Thinnings

The thinnings were made in a stand of Site III Douglas-fir on the Wind River Experimental Forest in southwestern Washington. The first thinning[1/] was made in 1939, when the stand was 97 years old, for the removal of piling; the second in 1952 for the removal of sawtimber. The effect of these thinnings on stand volumes, growth, and logging damage is being studied.

1/ Steele, Robert W. Light thinning in century-old Douglas-fir. Pacific Northwest Forest and Range Experiment Station. Research Note No. 43. May 1948.

By 1939 the stand had reached a stage where merchantable trees were dying from suppression, root rot (Poria weirii), and insect attacks. Only those trees which would make good piling were selected for the first thinning. Nevertheless, marking did result in cutting many trees that were going to die. The net growth was increased and potential mortality was utilized.

By 1952 the crowns had completely closed and the growth rate had decreased somewhat. Therefore, a second thinning was made. Improved market conditions in 1952 made it possible to remove the smaller intermediate and suppressed trees. We had more latitude for marking and could cut lower vigor trees than in 1939.

In selecting trees to be cut in 1952, greater consideration was given to increasing the vigor and improving the spacing of the remaining trees. The first criterion in selecting trees to cut was the presence, or suspected presence, of the root rot Poria weirii. After the Poria suspects were taken, all trees larger than 10 inches d.b.h. in the suppressed crown class, most of the intermediates, and some codominants from tight clumps were removed. An attempt was made to leave plenty of room for every remaining tree to grow. The cutting of Poria weirii infected trees often upset such uniform spacing, because Poria strikes in circles or foci rather than being uniformly scattered through the stand. A few trees that had been recently attacked by bark beetles also were removed.

Stand Volumes and Growth

Basic statistics (table 1) show that there are 67,494 board feet per acre left on the thinned area after the two thinnings.

There are fewer trees on the thinned acres, but they are larger. The average d.b.h. of the 76 trees per acre in the thinned stand is 21.6 inches, whereas the average d.b.h. of the 110 trees per acre in the unthinned stand is 20.8 inches. The percent of cut by board-foot volume in 1939 was 12 percent; in 1952, 18 percent. Both cuttings were light enough so that the stand was not opened up to the point where excessive windfall would result. The data on the thinned area are from seven 1-acre sample plots, which constitute a 40-percent sample of the thinned area. Data on the unthinned stand are from three adjoining 1-acre sample plots.

Periodic annual gross growth during the growth period 1946-1952 was 672 board feet per acre in the thinned stand, and 1,255 board feet per acre in the unthinned stand (table 2). Much more of the gross

Table 1. --Stand statistics before and after thinning (acre basis)

Item	Thinned stand				Unthinned stand			
	No. trees [1]	Aver. d. b. h.	Cubic vol. [2]	Bd. ft. vol. [3]	No. trees [1]	Aver. d. b.h.	Cubic vol. [2]	Bd. ft. vol. [3]
		In.	Cu. ft.	Bd. ft.		In.	Cu. ft.	Bd. ft.
1939:								
Stand	125	19.4	12,280	84,987	127	19.4	12,821	89,286
Cut	15	19.5	1,488	10,248	--	--	--	--
Reserve	110	19.4	10,792	74,739	--	--	--	--
1952:								
Stand	99	21.0	11,698	82,501	110	20.8	12,954	91,532
Cut	23	18.9	2,157	15,007	--	--	--	--
Reserve	76	21.6	9,541	67,494	--	--	--	--

1/ All trees 6 inches d. b. h. and over.
2/ All trees 6 inches d. b. h. and over to a 4-inch top, d. i. b.
3/ International 1/4-inch kerf rule: trees 8 inches d. b. h. and over to 6-inch top, d. i. b. (To convert to Scribner Rule multiply by . 776.)

Table 2. --Periodic annual growth and mortality in thinned and unthinned stands (per acre)

Growth period	Number seasons	Thinned stand		Unthinned stand	
		Cubic feet	Board feet Int. 1/4"	Cubic feet	Board feet Int. 1/4"
GROSS GROWTH					
1939 - 1946	7	142	1,100	121	937
1946 - 1952	6	87	672	168	1,255
MORTALITY					
1939 - 1946	7	49	315	95	639
1946 - 1952	6	45	294	176	1,228
NET GROWTH					
1939 - 1946	7	93	785	26	298
1946 - 1952	6	42	378	-8	27

growth was offset by mortality in the unthinned stand than in the thinned. In the period 1946 - 1952 the unthinned stand lost 1, 228 board feet per acre per year, and the thinned stand 294 board feet. Mortality is higher in the unthinned stand because the trees that die are not utilized; whereas on the thinned plots, trees that have just died or that will die in a few years are utilized.

The thinned stand surpassed the unthinned in net growth. In the 1946 - 1952 growth period, net growth in the thinned stand was 378 board feet per acre per year, compared to only 27 board feet in the unthinned stand. This higher net growth rate is attributable to salvage of potential mortality rather than to any actual increased growth rate of individual trees. Only trees released on three sides showed any appreciable increase in actual diameter growth rate. To release every tree on three sides would, of course, be impractical; the cut would be so great that excessive windfall would result. This thinning generally gave release on only one side.

The mean annual increment in the thinned stand was 876 board feet per acre in 1939, and 843 board feet per acre in 1952. In the unthinned stand there was a greater reduction during the same period: from 920 board feet per acre in 1939 to 832 board feet in 1952.

Logging Damage

Immediately after each of the thinnings an examination was made of the damage to residual trees in the logging operation. The 1939 thinning was done in the fall of the year with a small tractor (35 h.p. class), and 5 out of 110 trees per acre, or 4 percent of the residual trees, were scarred during the logging. The 1952 thinning was done in the spring of the year with the same size tractor, and 11 out of 76 trees per acre, or 14 percent of the residual trees, were scarred.

Part of the difference in logging damage was due to the difference in volume removed. The average size of trees cut for the two thinnings was nearly the same, 19.5 inches in 1939 and 18.9 inches in 1952, but the 1952 cut was a little heavier--18 percent against 12 percent in 1939. The rest of the difference was due to the season of the year in which the logging was done. In the spring when the bark was loose, only a slight amount of rubbing caused large chunks of bark to be peeled off. In the fall, the same amount of rubbing only roughened the surface of the bark.

Since the thinning was made so late in the life of the stand, it is believed that decay from the logging injuries will not develop seriously before the final harvest cut. For earlier thinnings, however, this would be an important consideration.

Conclusion

This test is an excellent example of two commercial thinnings that gave a profitable intermediate harvest, salvaged considerable material that would have been lost through mortality, and improved the vigor of the stand. Continued observation of growth rates will tell whether a third thinning can be made before the final-harvest clear cut is made.